Supporting Information

Life-history trade-offs and limitations associated with phenotypic adaptation under future ocean warming and elevated salinity

Michael D. Jarrold, Leela J. Chakravarti, Emma M. Gibbin, Felix Christen, Gloria Massamba-N'Siala, Pierre U. Blier, Piero Calosi

Table S1: ANOVA outputs (marginal) from linear mixed effects models testing the effects of within-generation exposure to elevated temperature (T) and elevated temperature and salinity (TS) conditions on all traits measured in the marine polychaete *Ophryotrocha labronica* La Greca and Bacci (1962). df: degrees of freedom, *F*: *F*-ratio/ χ^2: chi-squared and *P*: probability level. *P* values in **bold** indicate statistically significant effects.

Trait	Source	df	F/χ^2	*P*
Juvenile survival	Treatment	2	8.14	**0.017**
	Transplant	1	0.44	0.510
	Interaction	2	3.10	0.212
		61		
Juvenile growth rates	Treatment	2	46.42	**<0.001**
	Transplant	1	2.06	0.152
	Interaction	2	3.41	**0.034**
		341		
Maximum body size	Treatment	2	4.98	**0.010**
	Transplant	1	7.09	**0.010**
	Interaction	2	4.80	**0.012**
		61		
Fecundity	Treatment	2	21.45	**<0.001**
	Transplant	1	2.05	0.158
	Interaction	2	1.87	0.163
		61		
Egg volume	Treatment	2	6.91	**0.001**
	Transplant	1	0.00	0.976
	Interaction	2	0.14	0.866
		671		
Longevity	Treatment	2	2.92	0.062
	Transplant	1	2.39	0.128
	Interaction	2	7.66	**0.001**
		61		
CS activity	Treatment	2	3.16	0.052
	Transplant	1	0.97	0.329
	Interaction	1	3.93	**0.026**
		45		
ETS activity	Treatment	2	2.06	0.138
	Transplant	1	0.16	0.690
	Interaction	2	1.91	0.158
		54		

Table S2: ANOVA outputs (marginal) from linear mixed effects models testing the effects of within vs trans-generation exposure to T conditions on all traits measured in the marine polychaete *O. labronica*. df: degrees of freedom, *F*: *F*-ratio/ χ^2: chi-squared and *P*: probability level are given. *P* values in **bold** indicate significant effects.

Trait	Source	df	*F*/ χ^2	*P*
Juvenile survival	Treatment	2	5.18	0.075
	Transplant	1	0.29	0.592
	Interaction	2	3.57	0.168
		63		
Juvenile growth rates	Treatment	2	7.16	**<0.001**
	Transplant	1	1.84	0.176
	Interaction	2	0.71	0.495
		351		
Maximum body size	Treatment	2	10.53	**<0.001**
	Transplant	1	7.10	**0.010**
	Interaction	2	1.08	0.346
		63		
Fecundity	Treatment	2	8.34	**<0.001**
	Transplant	1	1.82	0.182
	Interaction	2	0.97	0.385
		63		
Egg volume	Treatment	2	5.13	**0.006**
	Transplant	1	0.00	0.977
	Interaction	2	0.27	0.765
		691		
Longevity	Treatment	2	6.19	**0.004**
	Transplant	1	2.05	0.158
	Interaction	2	2.83	0.067
		63		
CS activity	Treatment	2	3.17	0.051
	Transplant	1	0.84	0.364
	Interaction	2	0.68	0.513
		51		
ETS activity	Treatment	2	0.92	0.404
	Transplant	1	0.10	0.752
	Interaction	2	0.24	0.786
		57		

Table S3: ANOVA outputs (marginal) from linear mixed effects models testing the effects of within vs trans-generation exposure to TS on all traits measured in the marine polychaete *O. labronica*. df: degrees of freedom, *F*: *F*-ratio/ χ^2: chi-squared and *P*: probability level are given. *P* values in **bold** indicate significant effects.

Trait	Source	df	*F*/ χ^2	*P*
Juvenile survival	Treatment	2	10.93	**0.004**
	Transplant	1	1.77	0.184
	Interaction	2	1.89	0.388
		60		
Juvenile growth rates	Treatment	2	29.11	**<0.001**
	Transplant	1	1.95	0.164
	Interaction	2	5.29	**0.006**
		336		
Maximum body size	Treatment	2	0.45	0.643
	Transplant	1	7.48	**0.008**
	Interaction	2	5.07	**0.009**
		60		
Fecundity	Treatment	2	18.50	**<0.001**
	Transplant	1	1.71	0.195
	Interaction	2	1.46	0.240
		60		
Egg volume	Treatment	2	7.16	**<0.001**
	Transplant	1	0.00	0.977
	Interaction	2	2.64	0.072
		681		
Longevity	Treatment	2	0.99	0.377
	Transplant	1	1.98	0.165
	Interaction	2	5.24	**0.008**
		60		
CS activity	Treatment	2	1.70	0.195
	Transplant	1	0.82	0.372
	Interaction	2	3.35	**0.045**
		40		
ETS activity	Treatment	2	1.71	0.191
	Transplant	1	0.12	0.734
	Interaction	2	1.31	0.279
		53		

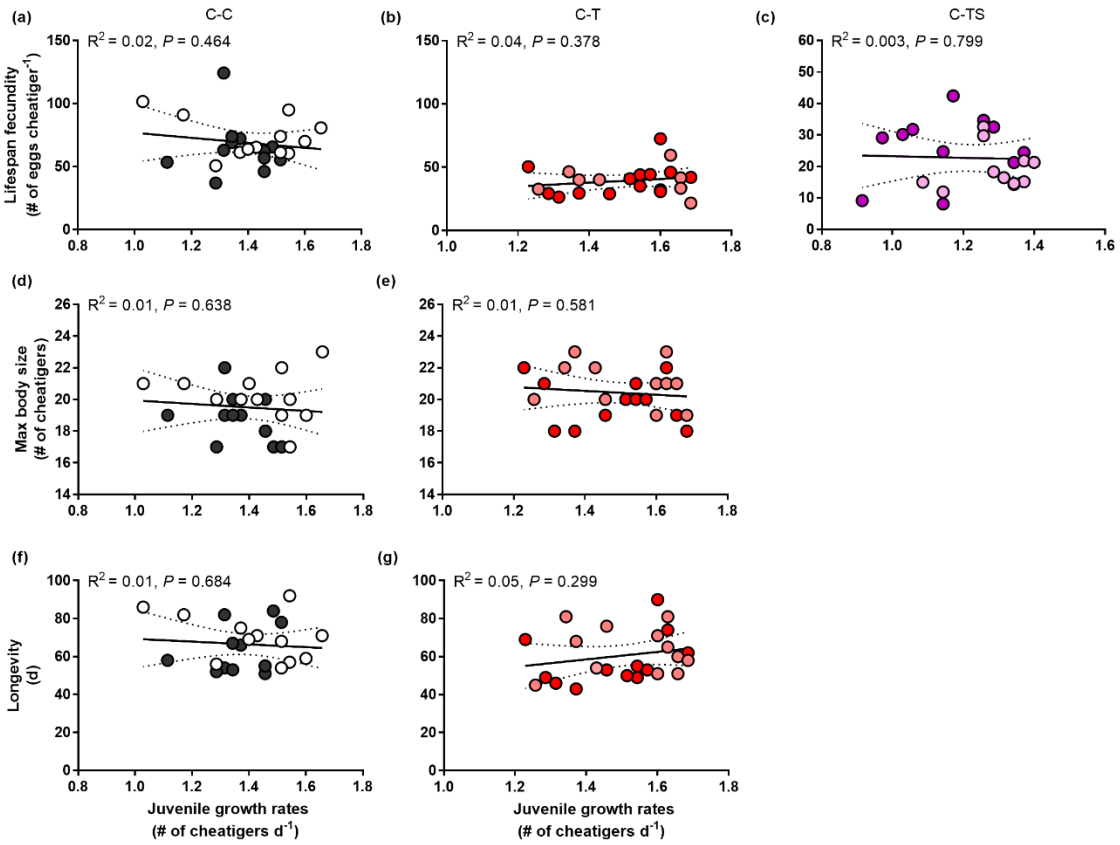

Fig. S1. Non-significant within-generation relationships between juvenile growth rates and adult life-history traits (lifespan fecundity (a,b,c), max body size (d,e) and longevity (f,g)) in the control-control (C-C), control-elevated temperature (C-T) and control-elevated temperature combined with elevated salinity (C-TS) treatments. Dark and light colours represent egg mass and juvenile transplants respectively. R^2 and *P* values are provided with significant relationships highlighted in **bold**.

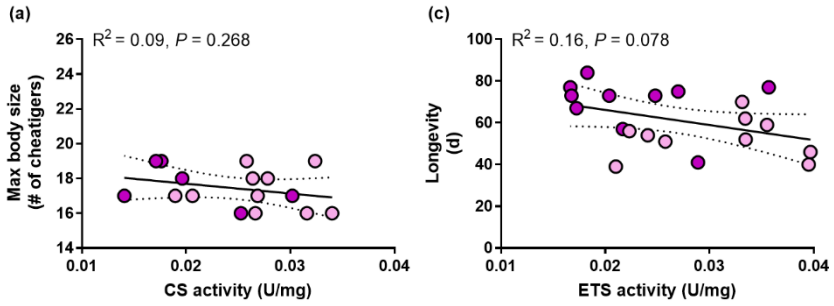

Fig. S2. Non-significant within-generation relationships between physiological and adult life-history traits in the C-TS treatment. (a) Citrate synthase (CS) activity *vs*. max body size and (b) ETS activity *vs*. longevity. Dark and light colours represent egg mass and juvenile transplants respectively. R^2 and *P* values are provided.

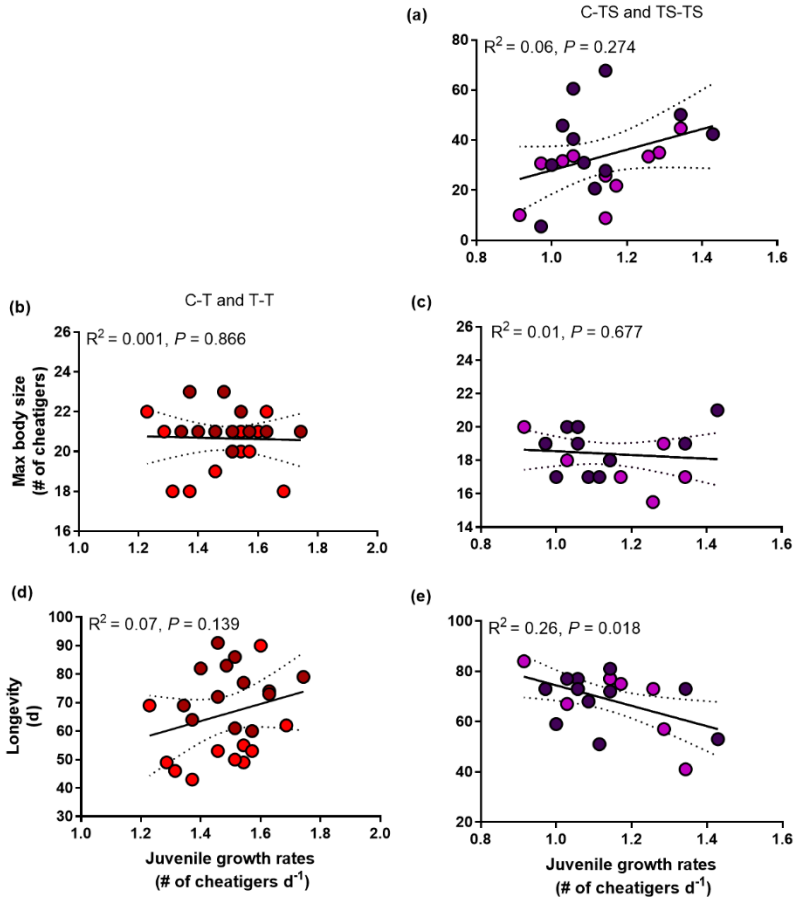

Fig. S3. Non-significant effects of trans-generation exposure on the relationships between juvenile growth rates and adult life-history traits under T and TS conditions. Juvenile growth rates *vs*. lifespan fecundity (a), juvenile growth rates *vs*. max body size (b, c) and juvenile growth rates *vs*. longevity (d, e). Light and dark colours represent egg mass transplants from the within- and trans-generation treatments respectively. R^2 and *P* values are provided.

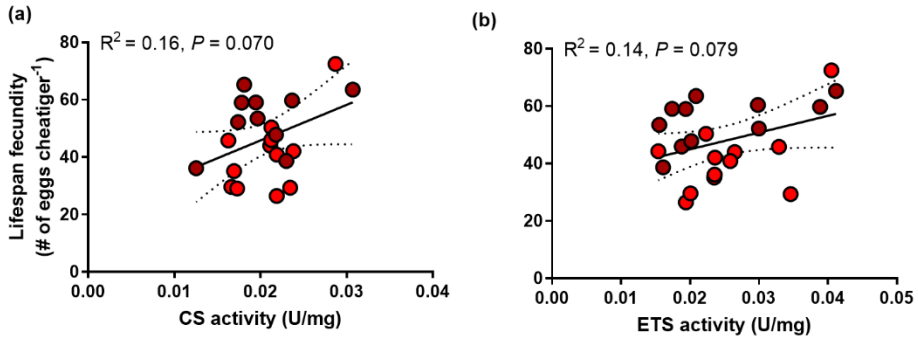

Fig. S4. Effects of trans-generation exposure on the relationships between physiological traits and lifespan fecundity under T conditions. CS activity vs. lifespan fecundity (a) and ETS activity vs. lifespan fecundity (b). Light and dark colours represent egg mass transplants from the within- and trans-generation treatments respectively. R^2 and *P* values are provided.

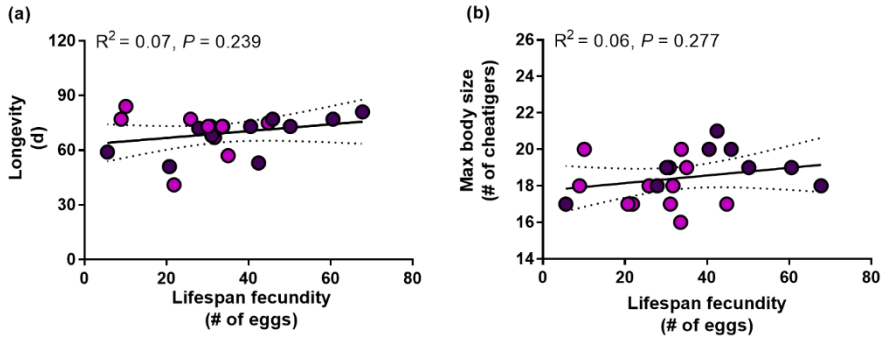

Fig. S5. Non-significant effects of trans-generation exposure to TS conditions on the relationships between adult life-history traits. Dark and light colours represent egg mass and juvenile transplants respectively. R^2 and *P* values are provided.